6.9.4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

IN REPLY
REFER TO: OEA-095 January 11, 1999
MEMORANDUM

SUBJECT: Bunker Hill, CLP Metals Analysis, Data Validation
Case: 26610
SDG: MJAE27

FROM: Laura Castrilli, Chemist
Quality Assurance and Data Unit, OEA

TO: Mary Kay Voytilla, Regional Project Manager
Office of Environmental Cleanup

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CC: Bruce Woods, Region 10 CLP TPO
Jim Stefanoff, CH2M Hill

The following is a validation of ICP-AES and mercury analyses of eleven water samples from the Bunker Hill project. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM04.0. Analyses were conducted by Sentinel Inc. of Huntsville, Alabama. This validation was conducted for the following samples:

Total (unfiltered) samples:

MJAE27 MJAE28 MJAE29

Dissolved (filtered) samples:

MJAE30 MJAE32 MJAE34 MJAE36
MJAE31 MJAE33 MJAE35 MJAE37

Data Qualifications

The following comments refer to the Sentinel Laboratory's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM04.0.* The comments presented herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The samples were collected

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between on 11/13/98. Mercury analyses were completed on 11/24/98. ICP-AES analyses were completed on 12/09/98.

2.0 Sample Preparation - Acceptable

The samples were prepared for mercury analysis on 11/19/98. The samples were prepared for ICP-AES analysis on 11/23/98.

3.0 Calibrations/Calibration Verifications - Acceptable

The samples were analyzed for mercury by CVAAS on 11/24/98. Initial calibration included one blank and five standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 11/29/98 (main analyses), 12/02/98 (ten fold dilutions for zinc in a few samples, and iron and manganese in sample MJAE34), and 12/09/98 (one hundred fold dilutions for samples MJAE33 (iron reported) and MJAE34 (zinc reported) and a five hundred fold dilution for zinc in sample MJAE33). The instrument was standardized according to the analytical method each day of analysis using one blank and a single calibration standard for each element.

All ICP-AES and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Calibration verification samples are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%. All ICP-AES and CVAAS (mercury) calibration verification (initial and continuing) samples bracketing reported sample results met the recovery criteria. Calibration verification samples were analyzed after every ten samples. No qualification was made based on ICP-AES or CVAAS calibration verification.

4.0 Laboratory Control Samples - Acceptable

Laboratory Control samples are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance criteria for control samples.

5.0 Blanks -

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified if the analyte concentration was less than five times the analytical value in the blank.

Zinc in the preparation blank had a negative value with an absolute

value greater than the IDL. Aluminum, arsenic, barium, cadmium, calcium, iron, magnesium, manganese, thallium, and zinc were detected in one or more ICP-AES continuing calibration blanks. Based on blank contamination, associated sample results were qualified as follows:

- aluminum in samples MJAE36 and MJAE37 was qualified 'U'
- arsenic in samples MJAE35 and MJAE37 was qualified 'U'
- barium in samples MJAE31 through MJAE36 was qualified 'U'
- thallium in samples MJAE30 through MJAE32 was qualified 'U'

All other sample results were greater than five times the associated blank levels (or were already undetected) and were not qualified based on blank contamination.

6.0 ICP-AES Interference Check Sample -

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120%. All ICS recoveries associated with reported sample results were within the recovery criterion with the exception of the recovery for zinc in the ICS-A (true value = 33 ug/L) analyses on. The recovery for zinc in the ICS-AB analyses (true value = 1,008 ug/L) was acceptable. Since the associated/reported zinc results in the samples were closer to or higher than the zinc levels in the ICS-AB sample, zinc results were not qualified based on the ICS-A zinc recoveries.

Ten, one hundred and/or five hundred fold dilutions were required in order to report zinc, iron and/or manganese results in seven of the samples as undiluted or less diluted results exceeded the instrumental linear range for one or more of these elements. The raw data for all analytes were compared using the available dilutions to see if 1) zinc, iron and/or manganese levels in the undiluted samples were high enough that interelement corrections may not be sufficient for the analytes that were reported from the undiluted analyses or 2) a pattern of suppression or enhancement was evident.

Sample MJAE33 was analyzed at 10, 100 and 500 fold dilutions (iron reported from a one hundred fold dilution, zinc reported from a five hundred fold dilution). Aluminum, antimony, arsenic, beryllium, calcium, cadmium, cobalt, copper, magnesium, manganese, nickel, silver, sodium, and thallium were qualified 'J', estimated (possible low bias) in sample MJAE33 as a pattern of suppression was observed when the undiluted, 10 and 100 fold dilution analyses were compared. In addition, selenium and vanadium were qualified 'UJ', estimated detection limit (pattern of suppression/possible false negatives) and lead was qualified 'J', estimated (pattern of enhancement/possible high bias) in sample MJAE33.

Sample MJAE34 was analyzed at 10 and 100 fold dilutions (iron and manganese reported from a ten fold dilution, zinc reported from a

hundred fold dilution). Calcium and magnesium were qualified 'J', estimated (pattern of suppression/possible low bias), vanadium was qualified 'UJ', estimated detection limit (pattern of suppression/possible false negative), and sodium was qualified 'J', estimated (pattern of enhancement/possible high bias) in sample MJAE34.

7.0 Duplicate Analysis - Acceptable

Duplicate analyses were done on dissolved sample MJAE30 and total sample MJAE27. Water duplicate results were within the ±20% Relative Percent Difference (RPD) or ±CRDL criteria for water results < 5 times the CRDL criteria. No qualification was made on this basis.

8.0 Field Duplicate Analysis - Not Applicable

Field duplicate analysis for samples in this SDG was not indicated in the field collection documentation.

9.0 Matrix Spike Analysis -

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analyses were done on dissolved sample MJAE30 and total sample MJAE27. All matrix spike recoveries were within the required QC limits; with the exception of antimony (68% for dissolved, 69% for total) and mercury (152% for total). All antimony results were qualified 'J', estimated (suspected low bias). Mercury results were not qualified as the recovery was high and mercury was not detected in the samples. Laboratory 'N' qualifiers were removed from the mercury results.

10.0 Graphite Furnace Atomic Absorption Spec (GFAAS) QC - Not Applicable -

GFAAS was not used for the analysis of these samples.

11.0 ICP-AES Serial Dilution -

Dissolved sample MJAE30 and total sample MJAE27 were analyzed by ICP-AES serial dilution to check for potential interferences. All analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within the 10%D criteria; with the exception of aluminum (10.5% for dissolved), cadmium (15.5% for dissolved), calcium (15.3% for dissolved), copper (10.6% for dissolved), iron (14.9% for dissolved), lead (16.1% for dissolved), magnesium (12.7% for dissolved), manganese (28% on dissolved), and zinc (15.2% for total, 12.7% for dissolved). Aluminum and copper results were not qualified based on serial dilution as the results were just outside the acceptance criteria.

The dissolved sample MJAE30 had fairly high iron, manganese, and zinc levels. The dissolved sample results were evaluated to see if a dissolved sample serial dilution from another SDG in this case could be applied to the dissolved samples in this SDG. Most of the dissolved samples in this SDG were closer to sample MJAE30. Dissolved samples MJAE30 through MJAE34 and MJAE36 were qualified based on the serial dilution results for sample MJAE30. Cadmium, calcium, iron, lead, magnesium, manganese, and zinc were qualified 'J' estimated (possible suppression or low bias) in samples MJAE30 through MJAE34 and MJAE36.

Dissolved sample MJAE35 was closer in native analyte levels to dissolved sample MJAE39 (analyzed for serial dilution in SDG MJAE38). Sample MJAE35 results were not qualified based on serial dilution as the serial dilution for MJAE39 met the acceptance criteria. Dissolved sample MJAE37 was closer in native analyte levels to dissolved sample MJAE19 (analyzed for serial dilution in SDG MJAE16). Sample MJAE37 results were not qualified based on serial dilution as the serial dilution for MJAE19 met the acceptance criteria (or was only slightly outside the acceptance criteria).

All total zinc results were qualified 'J', estimated based on serial dilution results.

12.0 Detection Limits - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the 'U' qualifier is attached. Contract Required Detection Limit (CRDL) standards are required to demonstrate a linear calibration curve near the CRDL. CRDL standards were run at the required frequency.

13.0 Overall Assessment of the Data

This validation of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94).* Approximately 33% of the data was qualified based on blank contamination, interference, matrix spike recovery or serial dilution results. The data as qualified is acceptable for all purposes.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (02/94) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE27

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16788S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	558		~~E~~	P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	27.5			P
7440-39-3	Barium	4.7	B		P
7440-41-7	Beryllium	0.60	U		P
7440-43-9	Cadmium	2.1	B	~~E~~	P
7440-70-2	Calcium	3690	B	~~E~~	P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	8.1	B		P
7440-50-8	Copper	4.2	B	~~E~~	P
7439-89-6	Iron	16200		~~E~~	P
7439-92-1	Lead	37.2		~~E~~	P
7439-95-4	Magnesium	1870	B	~~E~~	P
7439-96-5	Manganese	2010		~~E~~	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	6.3	B		P
7440-09-7	Potassium	737	B		P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	592	B		P
7440-28-0	Thallium	3.6	U		P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	968		~~E~~ J	P
	Cyanide				NR

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJAE28

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16789S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	128	B	~~E~~	P
7440-36-0	Antimony	4.0	U	~~N~~J	P
7440-38-2	Arsenic	2.0	U		P
7440-39-3	Barium	19.6	B		P
7440-41-7	Beryllium	0.60	U		P
7440-43-9	Cadmium	12.2		~~E~~	P
7440-70-2	Calcium	295000		~~E~~	P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	202			P
7440-50-8	Copper	7.3	B	~~E~~	P
7439-89-6	Iron	104000		~~E~~	P
7439-92-1	Lead	430		~~E~~	P
7439-95-4	Magnesium	325000		~~E~~	P
7439-96-5	Manganese	249000		~~E~~	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	185			P
7440-09-7	Potassium	14200			P
7782-49-2	Selenium	28.9			P
7440-22-4	Silver	53.7			P
7440-23-5	Sodium	2410	B		P
7440-28-0	Thallium	89.7			P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	28800		~~E~~J	P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE29

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16790S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	65.7	B	~~E~~	P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	3.0	B		P
7440-39-3	Barium	68.2	B		P
7440-41-7	Beryllium	0.60	U		P
7440-43-9	Cadmium	13.1		~~E~~	P
7440-70-2	Calcium	18200		~~E~~	P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	14.9	B		P
7440-50-8	Copper	9.1	B	~~E~~	P
7439-89-6	Iron	3100		~~E~~	P
7439-92-1	Lead	400		~~E~~	P
7439-95-4	Magnesium	35800		~~E~~	P
7439-96-5	Manganese	11500		~~E~~	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	18.3	B		P
7440-09-7	Potassium	1100	B		P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	2.5	B		P
7440-23-5	Sodium	872	B		P
7440-28-0	Thallium	3.6	U		P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	4420		~~E~~ J	P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE30

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16791S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3440		~~E~~	P
7440-36-0	Antimony	5.9	B	~~N~~ J	P
7440-38-2	Arsenic	27.1			P
7440-39-3	Barium	67.0	B		P
7440-41-7	Beryllium	2.2	B		P
7440-43-9	Cadmium	219		~~E~~ J	P
7440-70-2	Calcium	28700		~~E~~ J	P
7440-47-3	Chromium	3.0	B		P
7440-48-4	Cobalt	91.9			P
7440-50-8	Copper	193		~~E~~	P
7439-89-6	Iron	83000		~~E~~ J	P
7439-92-1	Lead	317		~~E~~ J	P
7439-95-4	Magnesium	51000		~~E~~ J	P
7439-96-5	Manganese	31700		~~E~~ J	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	91.0			P
7440-09-7	Potassium	1150	B		P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	10.2			P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	7.4	~~B~~	U	P
7440-62-2	Vanadium	5.1	B		P
7440-66-6	Zinc	119000		~~E~~ J	P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE31

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16792S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3450		~~E~~	P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	33.7			P
7440-39-3	Barium	28.8	~~B~~	4	P
7440-41-7	Beryllium	1.4	B		P
7440-43-9	Cadmium	222		~~E~~ J	P
7440-70-2	Calcium	28800		~~E~~ J	P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	83.9			P
7440-50-8	Copper	184		~~E~~	P
7439-89-6	Iron	88300		~~E~~ J	P
7439-92-1	Lead	409		~~E~~ J	P
7439-95-4	Magnesium	51300		~~E~~ J	P
7439-96-5	Manganese	32100		~~E~~ J	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	75.3			P
7440-09-7	Potassium	1140	B		P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	10.6			P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	7.7	~~B~~	4	P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	120000		~~E~~ J	P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE32

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16793S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6080		~~E~~	P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	120			P
7440-39-3	Barium	13.0	~~B~~	U	P
7440-41-7	Beryllium	2.4	B		P
7440-43-9	Cadmium	392		~~E~~ J	P
7440-70-2	Calcium	30300		~~E~~ J	P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	133			P
7440-50-8	Copper	328		~~E~~	P
7439-89-6	Iron	184000		~~E~~ J	P
7439-92-1	Lead	268		~~E~~ J	P
7439-95-4	Magnesium	52400		~~E~~ J	P
7439-96-5	Manganese	40200		~~E~~ J	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	113			P
7440-09-7	Potassium	1060	B		P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	15.8			P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	13.7		U	P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	211000		~~E~~ J	P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE33

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16794S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	196000		~~E~~ J	P
7440-36-0	Antimony	153		~~N~~ J	P
7440-38-2	Arsenic	7470		J	P
7440-39-3	Barium	17.5	~~B~~	U	P
7440-41-7	Beryllium	33.2		J	P
7440-43-9	Cadmium	9410		~~E~~ J	P
7440-70-2	Calcium	130000		~~E~~ J	P
7440-47-3	Chromium	9.7	B		P
7440-48-4	Cobalt	2910		J	P
7440-50-8	Copper	11400		~~E~~ J	P
7439-89-6	Iron	14100000		~~E~~ J	P
7439-92-1	Lead	204		~~E~~ J	P
7439-95-4	Magnesium	291000		~~E~~ J	P
7439-96-5	Manganese	29100		~~E~~ J	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	2210		J	P
7440-09-7	Potassium	152	B		P
7782-49-2	Selenium	1.9	U	J	P
7440-22-4	Silver	1.1	U	J	P
7440-23-5	Sodium	252000		J	P
7440-28-0	Thallium	128		J	P
7440-62-2	Vanadium	2.9	U	J	P
7440-66-6	Zinc	19800000		~~E~~ J	P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE34

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16795S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	16400		~~E~~	P
7440-36-0	Antimony	9.4	B	~~N~~ J	P
7440-38-2	Arsenic	294			P
7440-39-3	Barium	9.2	~~B~~	U	P
7440-41-7	Beryllium	7.7			P
7440-43-9	Cadmium	1680		~~E~~ J	P
7440-70-2	Calcium	54200		~~E~~ J	P
7440-47-3	Chromium	18.7			P
7440-48-4	Cobalt	342			P
7440-50-8	Copper	960		~~E~~	P
7439-89-6	Iron	1180000		~~E~~ J	P
7439-92-1	Lead	1020		~~E~~ J	P
7439-95-4	Magnesium	122000		~~E~~ J	P
7439-96-5	Manganese	183000		~~E~~ J	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	305			P
7440-09-7	Potassium	897	B		P
7782-49-2	Selenium	1.9	U	J	P
7440-22-4	Silver	41.3			P
7440-23-5	Sodium	18100		~~UJ~~ J	P
7440-28-0	Thallium	71.3			P
7440-62-2	Vanadium	2.9	U	J	P
7440-66-6	Zinc	1060000		~~E~~ J	P
	Cyanide				NR

dlc 01/11/99

dlc 01/11/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE35

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16796S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	641		~~E~~	P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	16.5		U	P
7440-39-3	Barium	5.5	~~B~~	U	P
7440-41-7	Beryllium	0.60	U		P
7440-43-9	Cadmium	12.2		~~E~~	P
7440-70-2	Calcium	4710	B	~~E~~	P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	11.3	B		P
7440-50-8	Copper	12.5	B	~~E~~	P
7439-89-6	Iron	19200		~~E~~	P
7439-92-1	Lead	29.5		~~E~~	P
7439-95-4	Magnesium	2910	B	~~E~~	P
7439-96-5	Manganese	3010		~~E~~	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	6.8	B		P
7440-09-7	Potassium	777	B		P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	545	B		P
7440-28-0	Thallium	3.6	U		P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	6110		~~E~~	P
	Cyanide				NR

01/11/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE36

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16797S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	30.1	~~B~~	~~E~~ U	P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	2.0	U		P
7440-39-3	Barium	21.0	~~B~~	U	P
7440-41-7	Beryllium	0.60	U		P
7440-43-9	Cadmium	13.4		~~E~~ J	P
7440-70-2	Calcium	318000		~~E~~ J	P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	219			P
7440-50-8	Copper	4.8	B	~~E~~	P
7439-89-6	Iron	108000		~~E~~ J	P
7439-92-1	Lead	286		~~E~~ J	P
7439-95-4	Magnesium	347000		~~E~~ J	P
7439-96-5	Manganese	263000		~~E~~ J	P
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	199			P
7440-09-7	Potassium	15100			P
7782-49-2	Selenium	33.0			P
7440-22-4	Silver	58.7			P
7440-23-5	Sodium	2750	B		P
7440-28-0	Thallium	96.1			P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	31100		~~E~~ J	P
	Cyanide				NR

oil/kg

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE37

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE27

Matrix (soil/water): WATER Lab Sample ID: 16798S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	334		~~E~~ 4	P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	8.2	~~B~~	U	P
7440-39-3	Barium	69.1	B		P
7440-41-7	Beryllium	0.60	U		P
7440-43-9	Cadmium	46.1		~~E~~	P
7440-70-2	Calcium	19800		~~E~~	P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	21.4	B		P
7440-50-8	Copper	22.9	B	~~E~~	P
7439-89-6	Iron	20900		~~E~~	P
7439-92-1	Lead	73.7		~~E~~	P
7439-95-4	Magnesium	38600		~~E~~	P
7439-96-5	Manganese	14300		~~E J~~	P dlc 01/11/99
7439-97-6	Mercury	0.10	U	~~N~~	CV
7440-02-0	Nickel	23.9	B		P
7440-09-7	Potassium	1170	B		P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	3.2	B		P
7440-23-5	Sodium	464	B		P
7440-28-0	Thallium	3.6	U		P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	20700		~~E~~	P
	Cyanide				NR dlc 01/11/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments: